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Market Myopia And Firm Specific Risk: Reexamining The Financial Value Of Information Technology Decisions

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Abstract

Information Technology (IT) event studies often focus on announcement period returns based on the capital asset pricing model (CAPM). This approach may have two sets of key limitations. First, the use of announcement period assumes the market is efficient in pricing the event. However, a firm not be aware of the organizational changes required for success of the IT event, or may not have the incentive to disclose such information for competitive reasons. Thus we expect many IT events to be characterized by low information disclosure, which may impede efficient pricing by financial markets. Second, IT event studies largely rely on CAPM, which only considers systematic risk, and assumes that idiosyncratic or firm-specific risk is eliminated through efficient diversification. Yet one of the foundations of IS is that IT matters, largely because firms have different capabilities to develop, deploy and manage IT resources. Thus there is a disconnect between a basic theoretical tenet of the IS field and the methodology deployed to assess the value of IT events. We develop a framework involving the maturity of the IT event and the scope of complementary changes to assess the extent of information disclosure and idiosyncratic risk. We empirically illustrate our approach for the case of large scale IT and IT-enabled outsourcing.

Keywords: Market myopia, idiosyncratic risk, CAPM, outsourcing

1. INTRODUCTION

One stream of firm-level studies of Information Technology (IT) impacts has deployed market-based measures of performance developed from capital market theories (Im et al. 2001; Melville et al. 2004). Such market based models assess the impact of IT "events" on shareholder value by estimating the difference between stock market returns conditional on the event and the unconditional expected returns over the announcement period. This approach assumes that the market *efficiently* prices the IT event during the announcement period itself. Further, these studies are based on the capital asset pricing model (CAPM), which considers only *systematic* risks stemming from the macro environment of a firm, but not firm specific or *idiosyncratic* risks (Bettis 1983; Chatterjee et al. 1999). We posit that depending on the nature of the IT event, there may be serious issues involving the assumption of efficient pricing during the announcement period as well as the exclusion of firm specific risk. Therefore we seek to highlight these potential pitfalls and develop a framework to assess the suitability of various market based assessment approaches for different categories of IT events.

The announcement period returns method is based on the efficient markets hypothesis (EMH), which posits that at any given time, the stock price of a firm reflects all publicly available information, and, in turn, the collective belief of investors regarding future prospects of the firm. However, for many types of IT events, the market may not have enough information to be efficient during the announcement period. While it may appear that greater disclosure by a firm of its IT capabilities will help reduce its cost of capital and increase its valuation, research in IS (e.g., Clemons 1991; Mata et al. 1995) finds that the extent to which IT confers competitive advantage is a function of its heterogeneity and imperfect mobility. This implies that information disclosure will likely engender competitive parity to an extent not justified by improvement in investor forecasts. This is especially pertinent to information on complementary investments in governance structures or work processes that determine heterogeneity in returns from IT investments (Brynjolfsson et al. 2002). For example, if a firm has conducted a comprehensive, ex ante cost-benefit analysis of a proposed investment in IT and business processes, a detailed disclosure of such information may have a negative impact in that competitors may act on such information to the detriment of the firm making the announcement.

IT events may also involve substantial uncertainty in the realization of benefits. Any downward revision to the ex ante benefits communicated in a detailed announcement will result in an adverse reaction from financial markets, thus providing a disincentive for elaborate market disclosure. As a result, announcements of IT investments typically entail the nature and broad objective of the investment, vendors involved, and a qualitative statement of anticipated benefits. Generally there is no mention of risks, options, managerial capabilities and investments in processes and human capital that may be needed to realize payoffs from the IT investment. Yet another scenario involves a firm undertaking an IT initiative without being aware of the complementary changes required for the successful assimilation of the technology applications (Barua et al. 1996; Brynjolfsson et al. 1996; Zhu 2004; Tanriverdi 2005). In such cases, there will be no disclosure of the critical non-IT facets of the event, making it difficult for the market to assess the likelihood of success within the announcement period.

A twin conundrum that limits the applicability of the market models involves their dependence on the CAPM, which incorporates only systematic risks in the pricing of expected returns on assets (Fama and MacBeth 1973), and which assumes that unsystematic, firm specific risks are eliminated through full diversification. However, theory and research in the field of IS are based on the premise that firms differ in their ability to assimilate technology into their work processes, and that such differential capability is an important source of competitive advantage (Armstrong and Sambamurthy 1999; Bharadwaj 2000; Bhatt and Grover 2005). This argument, often invoked in response to Carr's (2003) controversial thesis that "IT doesn't matter", underscores the point that even though an IT application or innovation may be easily available to most firms today, not all of them will be able to take advantage of such an opportunity due to firm specific differences, engendering significant variance in firm performance.

There is also some empirical evidence that IT risk, which is idiosyncratic to the firm, explains variance in firm returns. The IT business value and productivity literature reports abnormally high

estimates of returns to IT investments[1]. Further, Dewan et al. (2007) estimate about 30% of the gross return on IT investment may be explained by the premium associated with IT risk. They also find that IT risk is a significant contributor to firm risk. Thus there is both theoretical and empirical justification as to why firm specific differences (and hence, idiosyncratic risk) matter, and why deployment of methodologies based on CAPM may not be appropriate for many IT events. Despite such theory and evidence, to test the hypothesis that IT investments or decisions matter, IS researchers have often used methodologies that assume the alternative hypothesis. Thus, while on the one hand, IS theories have touted the idiosyncratic nature of how IT creates value as well as the risk of implementing IT successfully, market value based empirical studies have used variants of the capital asset pricing model that automatically assume that "IT (or any other idiosyncratic factor) doesn't matter."

We propose a framework to qualitatively assess the market efficiency and idiosyncratic risk of an IT event which is consistent with the foundations of IS research that (i) early movers have a competitive advantage with IT events and that (ii) capabilities to assimilate a new IT event vary across firms. This framework offers a resolution to the twin challenges posed by the assumptions of CAPM. The framework incorporates the maturity and the organizational scope of the IT event as two key elements. Maturity is the extent to which the technical and organizational nuances of a technology event are well-understood and documented (Weiss and Dale 1998). The scope of an IT event comprises complementary changes that are required for the success of the event. For example, ERP implementations will require major changes in business processes, decision rights and incentives to be effective (Jarrar et al. 2000). Our theoretical framework enables us to assess the level of market efficiency and idiosyncratic risk characterizing an IT event, thereby providing guidance in selecting an appropriate methodology to assess the value of the event. We illustrate the use of the framework with an analysis of the financial value of large scale outsourcing of IT and IT-enabled business functions. We find that the financial market prices these outsourcing announcements inefficiently in line with predictions of our model, resulting in long-term abnormal returns following the implementation of the outsourcing contract and a reversal of some results established in prior research. Further, we find that firm specific factors that influence returns to the outsourcing initiative are a significant contributor to the idiosyncratic risk of the firm. Together, the results emphasize the need to shift from market models to those that include firm characteristics in pricing IT events that are low in maturity and high in the scope of organizational change that they engender.

2. SHORT-TERM MARKET PERFORMANCE MEASURES

Several studies in IS (e.g., Dewan and Ren 2007, Meng and Lee 2007, Dehning et al. 2003, Hunter 2003, Ranganathan and Brown 2003, Subramani and Walden 2001, amongst others) have used announcement period returns to provide evidence of value creation or destruction by IT decisions in a firm. In doing so, these studies implicitly assume (i) efficient pricing of the decision by financial markets, and (ii) diversification of idiosyncratic risk. However, while prior research in IS has *assumed* market efficiency and largely estimated the magnitude and direction of announcement returns, event studies have been used in Finance to *test* market efficiency:

"…Systematically nonzero abnormal security returns that persist after a particular type of corporate event are inconsistent with market efficiency. Accordingly, event studies focusing on long-horizons following an event can provide key evidence on market efficiency…" (Kothari and Warner 2004):

Tests of market efficiency involve estimation of abnormal returns over longer horizons, typically twelve months or more. Interest in the finance literature in long-horizon studies was spurred by accumulation of evidence inconsistent with the efficient markets hypothesis and the identification of risk factors other than market risk that explained variance in firm returns. Yet, there is little research in IS that examines whether the response of the financial market to IT choices or events is slow, incomplete or even biased.

2.1 Efficiency of Market pricing of IT events

The assumption of *market efficiency* is critical to inferences drawn from short-horizon event studies. The finance literature distinguishes between tangible and intangible information. This distinction is described as the difference between explicit measures of past performance such as sales or cash flow information that can be observed from the firm's accounting statements and the orthogonal component of information about future performance, which is unrelated to past accounting performance (Daniel and Titman 2006). Daniel and Titman (2006) demonstrate that there is no discernible relation between a firm's future stock returns and tangible performance information. The returns are related to realizations of intangible information. Thus, markets are imprecise in interpreting intangible performance information. Daniel and Titman (2006) conjecture intangible information is related to firms' growth opportunities.

We suggest that large and complex IT decisions are akin to long-term investments. Further, even though IT events are represented by their direct costs when expensed in accounting statements, we argue that the benefits of the IT decision reflect intangible information on future cash flows. This is because many decisions such as governance choices for IT outsourcing or management processes to assimilate new technologies that impact returns to the IT investment are rarely announced formally, engendering important *acquisition costs* for such information. Further, even if this information were disclosed, financial markets may incur important *learning costs* in interpreting and in turn, pricing the information.

2.2 Idiosyncratic risk

Another assumption that is integral to short horizon studies is that of diversification of firm specific risk. This assumption has been challenged by early studies in strategy (Bettis 1983), which argue that the incorporation of unsystematic risk in asset pricing models is especially important since idiosyncratic risk, which the equity markets do not reward, lies at the heart of strategic management. Empirical studies also contend that markets care about more than just systematic risk. For instance, Chan, Hamao and Lakonishok (1991) find that earnings and cash flow yield, size, and book to market ratio are significantly correlated with expected returns in the Japanese market. These variables proxy for risks not otherwise accounted for by beta (systematic risk). The relationship between idiosyncratic risk and returns is especially pertinent to the pricing of IT events. Heterogeneity in performance of IT investments is often attributed to firm level characteristics including organizational structures, processes and other capabilities that complement the IT investment (Armstrong and Sambamurthy 1999; Brynjolfsson et al. 1996). These firm attributes are an important predictor of volatility in cash flows from the IT investment and hence, an important component of IT risk.

Further, the risk associated with large IT decisions, due to the latter's broad scope and salience to a firm's strategy and operations, is likely to affect firm risk. Dewan et al. (2001) find that (a) about 30% of the gross return on IT investment corresponds to the risk premium associated with IT risk, and (b) IT risk is an important contributor to firm risk. Together, the results suggest that the pricing of IT events must shift from models that consider market risk alone to include idiosyncratic firm characteristics and risk. In the next section, we address these issues and offer a theoretical resolution for the use of performance measures in market value based IS research.

3. RECONCILING MARKET MEASURES WITH IS RESEARCH

We present a theoretical framework to classify IT events in terms of the *maturity* of the event and the *scope* of organizational changes required to successfully assimilate the event. We argue that such classification helps us choose the right approach (e.g., short- or long-term market reaction) to assess the financial value of the event. IT maturity has been studied in terms of the S-shaped adoption curve, which captures how the total number of adopters increases over time. Weiss and Dale (1998) argue that IT risks decrease with longevity. Mature technologies are "*easy to use and possess the comforting attributes of consistent performance and predictable life-cycle costs*" (Weiss and Dale 1998). A technology's longevity confers advantages of user trust and a history of incremental improvements that have resulted in very stable products and services. Organizational learning that accompanies mature technologies also contributes to lower risks of implementation (Boudreau and Rose 2000). The idiosyncratic risk associated with low maturity arises from the variance in the ability of firms to assimilate a relatively new and unproven technology. Immature technologies adopted by innovative or

pioneering firms may also confer competitive advantage (Dos Santos et al. 1993), which may wear out over time. However, given the risk of failure arising from the unproven nature of the technology, it may be difficult for markets to price such events in the short run. Thus long-term abnormal returns are more likely to accrue to events with low maturity.

While the maturity of a technology event provides guidance on market efficiency and idiosyncratic risk, the scope or the extent of the effort required to manage the IT event is another factor that can significantly affect efficiency and risk. Barua et al. (1996), Brynjolfsson et al. (1996), Zhu (2004) and Tanriverdi (2005) have argued that successful IT investments need complementary organizational changes that involve strategies, business processes, decision rules, and authority. Some IT decisions such as the adoption of a new supply chain system require major technology and business process changes, not only within the focal firm, but also in partner organizations (Barua et al. 2004).These changes required for IT events, if not properly managed, can lead to significant organizational turmoil, even "*jeopardizing the core operations of the implementing organization*" (Hong and Kim 2002). The greater the investment in complementary organizational capital required to implement and manage an IT initiative, the higher the idiosyncratic risk, and the lower the market efficiency during the announcement period.

Together, the maturity and the organizational scope of the IT event determine the ex ante uncertainty in cash flows from the IT investment and, in turn, the market efficiency in valuing the investment (Figure 1). We illustrate below why Enterprise Resource Planning (ERP) initiatives characterized by high maturity and scope are likely to be characterized by high idiosyncratic risk and announcement period market inefficiency. We then focus on large scale IT services and business process outsourcing (low maturity and high scope) and empirically demonstrate the presence of idiosyncratic risk and market inefficiency.

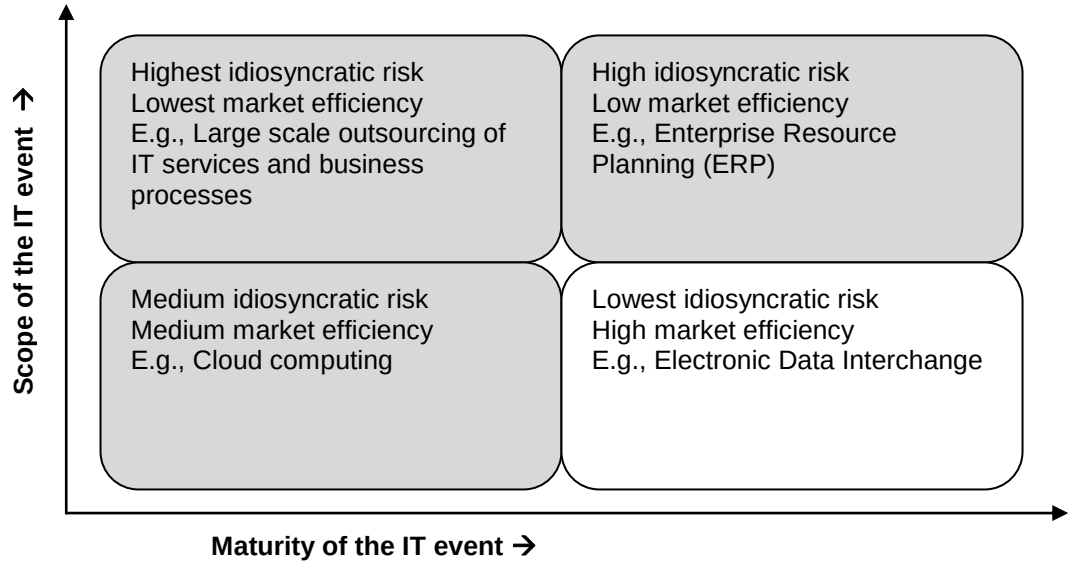

Figure 1. IT Event Attributes and Market Efficiency

ERP has been in existence since the early nineties (Hong and Kim 2002). Many academic and industry studies have uncovered best practices and critical success factors for ERP implementations. To that extent, the decision to implement an ERP system today can be considered a mature event. However, ERP success is contingent on several complementary organizational changes, including the assimilation of new processes and work systems, end user training, top management support, and other change management procedures. The business press abounds with examples of high-performing firms (e.g., Nestle, Hershey, etc.) which experienced major snafus in their ERP implementations because of their inability to make some of these complementary changes (Worthen 2002; Katz 2001). Thus, ERP implementations may be associated with high idiosyncratic risk and market inefficiency.

To provide some prima facie empirical evidence that markets may significantly underreact to ERP events, we consider two published studies by Ranganathan and Brown (2006) and Hayes et al. (2001), which found announcement period returns of 1.47% and 0.19% respectively. In line with the efficient markets hypothesis, we interpret the increase in the market value of a firm during the announcement period as the net present value (NPV) of the ERP project. We use the ERP cost/revenue ratio from documented case studies to create a proxy for ERP costs [2], and calculate the implied ERP cost for the Ranganathan and Brown (2006) and Hayes et al. (2001) studies as shown in Table 1.

If markets are efficient, then the NPVs in Table 1 represent the true value of ERP implementations in the sample. However, are these NPVs large enough for rational managers to invest in large, complex, and transformative initiatives like ERP? One survey found that 80% of ERP projects experience cost overruns that range between 40 and 85%, while another found an average cost overrun of 178% (http://www.snartak.com/erp.htm). It would take a cost overrun of 40.2% (the minimum reported overrun in the above survey) and just 6.2% in the cases of Ranganathan and Brown (2006) and Hayes et al. (2001) respectively to drive the corresponding NPVs to zero. At the highest reported overrun of 178%, the corresponding NPVs would be -439M and -$316M respectively. Given the well-documented risks of cost overruns as well as major delays and other organizational disruption, senior management would not have approved projects with such high costs and relatively low benefits. Assuming firms made rational investment decisions, we can infer that the market under-reacted to these ERP events during the announcement period, and that only long-term returns can capture the impact of such an investment.

Large scale outsourcing of IT and IT enabled business functions, the focal case for the balance of the paper, is a relatively new phenomenon (for example, a majority of our sample of 100 largest outsourcing engagements occurred after 2000) compared to, say, ERP or EDI. Firms engaging in large, complex outsourcing deals are still experimenting with appropriate governance mechanisms, reflected in the misfit between governance choices and the nature of the outsourced task in a significant percentage of outsourcing engagements (e.g., Mani et al. 2010, Susarla et al. 2009). Further, large-scale outsourcing engagements entail significant effort in contract design and management, and communication and coordination between the client and vendor, all of which necessitate important complementary investments in processes, control structures, and technologies (Bapna et al. 2010). Given the low maturity and expansive scope of large scale outsourcing initiatives, we expect the latter to be characterized by high idiosyncratic risk, low information disclosure, and lowest market efficiency in our framework.

4. MARKET MYOPIA AND IDIOSYNCRATIC RISK IN OUTSOURCING

4.1 Theory and Hypotheses Development

To illustrate the use of our framework and assessment of the financial value of large, complex IT events, we collected and analyzed data on the 100 largest outsourcing initiatives implemented between 1996 and 2005. At the end of 2008, the outsourcing of IT and IT-enabled business processes constituted over 50 percent of the average firm's technology budget (Gottfredson et al. 2005). Further, outsourcing has transitioned from a cost saving tool for transaction intensive functions such as payroll to include the externalization of end-to-end business functions such as product development or financial management that directly impact firm competitiveness. This shift in the nature of outsourcing is evidenced in the growing value of outsourcing contracts – Gartner reported that in 2007, the average outsourcing contract value was $204 million while the total contract value for that year was $30 billion.

[2] In 1999, Hershey spent $115 million on an ERP system (Katz 2001), while Nestle U.S.A., the $8.1 billion subsidiary of Nestle, invested $210 million on an ERP project to overhaul its existing IT systems (Worthen 2002). Using the ratio of ERP investment to revenues, we obtain 2.90 for Hershey (revenue = $3.97 billion in 1999), and 2.59 for Nestle U.S.A. as the upfront cost of ERP systems as a percentage of revenue. We use 2.74 as the average ERP/Revenue ratio. We assume 10% of the upfront cost as annual maintenance cost and 8% as the cost of capital.

However, despite their expanded reach and impact, researchers and practitioners have highlighted the high failure rate of emergent large scale outsourcing initiatives, emphasizing that organizations remain largely unprepared to manage the transformation brought about by these initiatives. As a consequence, although the cost of a large outsourcing decision is tangible because it is announced and expensed, its benefits are uncertain and reflect "intangible" information about future cash flows. The uncertainty in future cash flows and allied unpredictability in lifecycle costs emphasizes the *low levels of maturity* of emergent, broad outsourcing initiatives in the firm.

Further, the management of large-scale, end-to-end services outsourcing poses a set of challenges that are relatively new and still evolving. Prior research (e.g., Mani et al. 2010; Gopal et al. 2003) shows that the performance of such outsourcing initiatives is contingent on choice of appropriate governance mechanisms, including contractual structures and relationship management processes. The need to discern these unique management challenges and invest managerial time and effort in solutions in large outsourcing initiatives reflects the relatively *greater scope* of these initiatives. Figure 2 below reflects the transition in outsourcing from the periphery to the core of the firm and the allied shift in maturity and organizational scope of the outsourcing initiative.

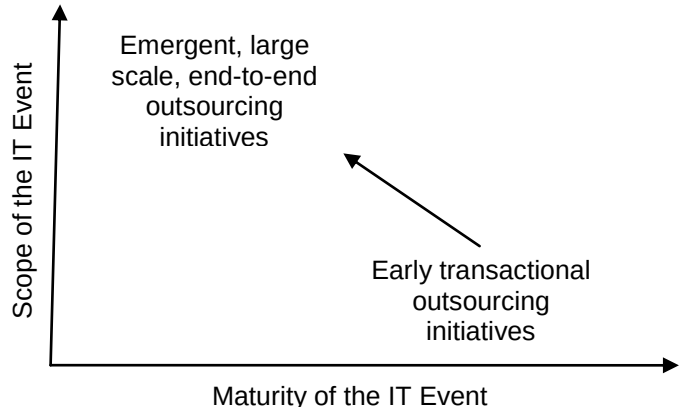

Figure 2. The shift in maturity and scope of outsourcing initiatives

The relatively low maturity and high scope of large scale outsourcing events render them an ideal context to study whether markets are efficient or myopic in their evaluation of complex IT decisions. In order to efficiently price the outsourcing event, financial markets must be able to distinguish between different types of outsourcing initiatives in terms of various task and relational attributes, and their associated management challenges. The outsourcing firm itself may not recognize the above challenges and solutions, and even if it does, it may not have the incentive to disclose such information for competitive reasons. Thus, financial markets must incur *information acquisition costs* to efficiently price the outsourcing event. In addition to costs the market must expend on acquiring information on firm and task attributes that may impact the outcome of outsourcing, the interpretation of such information involves important *information learning costs*. The acquisition and learning costs associated with information on the outsourcing event render arbitrage costly. Thus, the assumptions that all markets are always in equilibrium and always perfectly arbitraged are inconsistent with the nature of the event. We expect that information asymmetries introduced by acquisition and learning costs will be persistent and take a long time to be corrected by arbitrage forces. This engenders abnormal performance over a long horizon following the outsourcing event so that the price response to this IT event refutes the principle of efficient markets:

Hypothesis 1 *– Financial markets will be myopic in incorporating information on large-scale outsourcing of IT and IT enabled business functions. This results in significant long-term abnormal returns following the implementation of the outsourcing initiative*.

While CAPM based approaches to assessing IT events do not consider idiosyncratic risk, large scale outsourcing of end-to-end functions such as supply chain management or new product development

may carry significant risk for the entire firm, for any failure is likely to cause major disruptions to its operations. Outsourcing risk starts with the very decision to externalize IT services or one or more business function(s). Given that firms differ considerably in their work processes and routines, the outcomes of externalization of end-to-end functions may have high variance. For example, a firm may have modular processes while another may have a tightly coupled value chain; if both firms decide to outsource a given business function, the former is likely to extract more value from the arrangement, everything else being equal. Similarly, many firms are less prepared than others to handle the management of the outsourcing relationship.

A second contributor to outsourcing risk stems from the differential ability of firms in selecting and executing the right governance mechanism. Transaction Cost Economics (TCE) focuses on relational uncertainty, and provides guidance on the choice of governance structures to mitigate hazards in exchange relationships. For example, Mani et al. (2010) posit that simple outsourcing tasks should be governed by arms length relationships and well-defined performance criteria, while more complex engagements may require elaborate relational governance mechanisms. Misfit between the ideal and actual governance choices lowers operational performance and client satisfaction (Mani et al. 2010).

These above challenges are further exacerbated by factors such as the uncertainty in the firm's business environment (which necessitates frequent changes in the outsourced task(s)) and the level of coordination required with the service providers. Mani et al. (2011) demonstrate that more complex outsourcing tasks require significant attention to joint action with the vendor and investment in communication technologies. Similarly, experience in outsourcing management and prior association with vendor(s) are expected to help clients realize favorable outcomes from the outsourcing engagement (Mani et al. 2011). In other words, various firm attributes make it easier or more difficult for some firms to succeed in their outsourcing endeavors than others. Given the scale and impact of the IT event, these attributes that determine abnormal returns to the outsourcing initiatives are an important component of idiosyncratic or firm specific risk. Thus we posit:

Hypothesis 2 *–Firm characteristics explain variance in the cross section of abnormal returns as well as idiosyncratic risk in large-scale outsourcing of IT and IT enabled business functions.*

4.2 Data

Our data comprises of the hundred largest outsourcing initiatives implemented between 1996 and 2005. The largest outsourcing contracts have important advantages over a similar random sample. First, the firm-level economic impact of outsourcing is more likely to be detected when the contract value is large. The average lifetime contract value in our sample is $922 million. The aggregate contract value of $83 billion represents approximately 18 percent of the total outsourcing contract value for the sample period. Second, our focus on large deals reduces the probability of confounding events; firms are less likely to sign as large contracts immediately prior or subsequent to the outsourcing agreement. Our approach to sample selection follows prior research in finance (e.g., Healy, Palepu and Ruback 1992) that examines the performance impact of managerial decisions such as mergers or acquisitions.

Information on the hundred largest outsourcing initiatives and their governing contracts is obtained from International Data Corporation's (IDC) services contracts database. IDC tracks outsourcing contracts signed around the world with the database comprising nearly 21,000 service contracts. This data dates back to 1996, and is the primary input to this study. We use Lexis-Nexis and the Dow Jones News Retrieval Service to verify and supplement IDC information on announcement and signing dates. We use the Center for Research on Security Prices (CRSP) files to compute abnormal stock returns, and the Compustat Basic and Research files to assess firm characteristics, develop operating performance measures, and estimate insider trading activity. Our final sample comprises the 100 largest outsourcing contracts that satisfy two requirements. First, the firm must be publicly traded on a major United States stock exchange. Second, information on the contract used to govern the outsourcing initiative must be available. Our final sample of 100 contracts includes 66 firms.

Outsourcing initiatives in our sample are classified as one of Information Systems (IS) Outsourcing, Business Process Outsourcing (BPO) or Processing Services, and Application, Network

and Desktop Management. In the case of IS outsourcing services, the service provider takes ownership of and responsibility for managing all or large part of a client's IS infrastructure and operations, often involving customized, one-to-one engagements. If only the network and desktop environment are outsourced, the spending is classified as network and desktop management services. Likewise, if only the application environment is outsourced, the spending is classified as applications outsourcing. Network management services involve the outsourcing of the operations of a specific segment or entire network communication system of a company. Desktop management captures contracts for which several desktop services are outsourced to the same provider. BPO involves outsourcing business processes or functional areas (such as logistics or HR), with performance metrics tied to new business opportunities, revenue generation, customer satisfaction and business transformation.

4.3 Empirical Analyses and Results

First, we test the market efficiency hypothesis (Hypothesis 1) by examining the significance of long-term abnormal returns following the outsourcing event. We also compare the magnitude and direction of long-term abnormal returns with that of announcement period returns to establish market myopia. Finally, we test Hypothesis 2 by analyzing the impact of various attributes that are idiosyncratic to the outsourced task environment on long-term abnormal returns and idiosyncratic risk of the firm.

Long-term Abnormal Returns: As a first test of market efficiency, we report the three year buy and hold abnormal returns (BHAR) for all sample outsourcing firms following the implementation of the outsourcing contract. We use the characteristic based matching approach, also known as the event-time portfolio approach to calculate long-term abnormal returns. Mitchell and Stafford (2000) describe event time BHAR as "*the average multi-year return from a strategy of investing in all firms that complete an event and selling at the end of a pre-specified holding period versus a comparable strategy using otherwise similar nonevent firms*". Thus, the BHAR for stock i over holding period T is:

$$BHAR_{i,T} = BHR_{i,T} - BHR_{m,T}, \quad (1)$$

where $BHR_{i,T}$ is the buy-and-hold return of the sample firm and $BHR_{m,T}$ is the buy-and-hold return of the matching control firm over the same period. Here, the buy-and-hold return for holding period T beginning time *a* through time *b* is:

$$BHR_{i,T} = [\prod_{t=a}^{b}(1+r_{it}) - 1], \quad (2)$$

where r_{it} is the return for firm i in month t; in this study, period *a* is the month after the contract effective month and period *b* is the earlier of the firm's delisting date or the end of the three year period following the contract effective date.

Following Barber and Lyon (1997), we consider an industry-, size- and book-to-market matched sample as a benchmark of returns post implementation of the outsourcing contract. We begin with a group of firms in the same two-digit SIC code as the sample that do not engage in a strategically significant outsourcing initiative as of the beginning of the contract effective year. From this initial screen, a matched firm is defined as the firm that has the lowest absolute value of the joint difference in size (equity capitalization) and book-to-market ratio (equity capitalization divided by book value of equity).

We draw on prior research to identify a set of firm, process and relational attributes that may influence the uncertainty and complexity of the outsourcing initiative, and in turn, the transaction costs and operational and financial gains from outsourcing. These attributes include uncertainty in the business requirements of the client (UNCER), coordination requirements of the outsourced task (COORDN), prior association between the client and the provider (PRIOR), and experience of the outsourcing firm in managing similar outsourcing initiatives (EXP). Uncertainty is measured as the variance in the outsourcing firm's return on assets (RoA) over the three years prior to the contract effective year. Anticipated coordination requirements is estimated based on the outsourcing rationale for the given business function. We infer trust based on the bid type, which is one of competitive, incumbent or sole sourced. Competitive bidding suggests the absence of prior association between the firms. Incumbent bidding implies that the outsourcing firm has an existing relationship with the

provider. A sole-sourced contract means that the provider is the only provider of the outsourced function. The cumulative number of strategic alliances across a firm's life served as a proxy for the depth of its outsourcing experience.

Panel A of Table 2 reports the mean three-year BHAR from outsourcing for the lowest and highest 30 percent of firms ordered by UNCER, COORDN, PRIOR and EXP. In line with the greater transaction costs of managing complex, uncertain relationships, we find that outsourcing initiatives in the highest 30 percent of UNCER and COORDN and the lowest 30 percent of PRIOR and EXP were characterized by negative BHAR. In contrast, outsourcing initiatives in the lowest 30 percent of UNCER and COORDN and the highest 30 percent of PRIOR and EXP were characterized by positive BHAR. The "difference" column reports the difference in returns between the two sub-samples. Panel B reports equivalent results for the sample of firms for which all three years' return data is available - the returns reported in Panel A underestimate those in Panel B. The results in Table 2 confirm Hypothesis 1: Markets are unable to efficiently price large scale outsourcing events, low in maturity and expansive in their scope, resulting in long-term abnormal returns following the event. In particular, at the announcement of the event, the market is unable to distinguish between different types of outsourcing initiatives in terms of the management challenges and the consequent performance impacts.

Announcement Period Returns: As further evidence of market myopia, we report announcement period returns and wealth effects for our sample of initiatives in Table 3. Prior research in IS on the financial value of outsourcing initiatives has almost exclusively focused on announcement period returns. Consistent with this stream of research, we estimate daily abnormal returns for the firms. A period of 150 days [-170,-21] prior to the announcement date is used to estimate the market model. Significance of the returns is based on the market model standardized residual method with Scholes-Williams (1977) betas. The estimates from this model are then used to predict daily returns for each firm i over three event windows[3] – a 3 day period [-1,+1], a 12 day period [-10, +1] and a 20 day period [-10,+9] surrounding the announcement of the outsourcing initiative.

Table 3 reports results of the above event analyses for the lowest and highest 30 percent of firms ordered by UNCER, COORDN, PRIOR and EXP. Returns are positive and significant for initiatives characterized by high coordination complexity. The results are robust to estimation by contract type. The insignificance of announcement period returns and reversal of the direction of returns for various categories of outsourcing initiatives provide evidence of market myopia in support of Hypothesis 1.

Idiosyncratic Risk and Returns: In order to test Hypothesis 2, we analyze whether (a) characteristics of the IT event contribute to the long-term BHAR of the firm, and (b) characteristics of the IT event are an important component of idiosyncratic firm risk. In this case, we analyze whether attributes of the outsourced task environment – UNCER, COORDN, PRIOR and EXP – influence the BHAR following the implementation of the outsourcing contract and the idiosyncratic risk of the outsourcing firm. Table 4 presents the results of our analyses. Model I estimates the influence of the firm-, process- and relationship-level attributes on the three year BHAR following the implementation of the outsourcing contract while controlling for self-selection into the outsourcing decision and choice of outsourcing contract[4]. Firm and time effects are also controlled for. Robust standard errors clustered by firm are reported in parentheses. We find that uncertainty in the outsourcing firm's business environment, coordination requirements and prior association with the vendor impact returns to the outsourcing initiative. The results suggest that complex outsourcing initiatives, characterized by changing business requirements and higher levels of coordination, are correlated with dissipation of efficiency gains from outsourcing. This is likely because of greater risks of cost overruns, opportunism, and coordination failures in these environments. There are "severe limits to what can be achieved through contracting" (Banerjee and Duflo 2002) to mitigate these risks, and outsourcing

[3] Prior research in IS has focused almost exclusively on the 3 day window. However, given the scale of the initiative, we expect information leakage in the market, and report returns for longer event windows as well.

firms must often invest in appropriate relationship management procedures to counteract the problems created by the limitations of contracting. Yet, empirical research (Mani et al. 2010) on outsourcing governance finds that the lack of organizational awareness or preparedness for such investments results in efficiency losses from outsourcing. Our results are consistent with this outcome. Further, they suggest that efficiency losses in complex outsourcing environments are exacerbated by lack of prior association between the outsourcing firm and the vendor.

Model II analyzes whether the characteristics of the outsourced task environment that impact returns to the outsourcing initiative are an important component of the idiosyncratic risk of the firm. We measure the idiosyncratic risk for each of the outsourcing firms as the annualized standard deviation of residuals from a market model regression based on daily returns (Bali et al. 2005, Ali et al. 2003, Malkiel and Xu 2006). We find that uncertainty in the firm's business environment positively contribute to the idiosyncratic volatilities of the firm. The results in Table 4 also suggest unobserved firm attributes that influence the choice of a contract are associated with long-term returns and idiosyncratic risk of the firm.

Overall, our results confirm that firm capabilities to manage IT events are important determinants of returns to the event. Further, our findings suggest that these capabilities are an important element of idiosyncratic firm risk. Thus, the use of asset pricing models such as CAPM that assume diversification of idiosyncratic risk and only consider non-diversifiable market risk in pricing IT events is inconsistent with the very nature of IT events. Abnormal returns to IT events may be estimated after controlling for market risk and other risks such as value or growth risks; however, the association between these abnormal returns and firm characteristics must be understood to accurately price the IT event.

5. IMPLICATIONS AND CONCLUSION

The above theoretical arguments and empirical evidence have important implications for what measures of financial value should be used to price IT events in consonance with the basic tenet that firms differ in their ability to manage and extract value from IT investments and that such differences are a key source of competitive advantage. In this context, we identify below research issues that require attention while testing hypotheses pertaining to the financial value of IT management decisions.

Time horizon for calculation of returns to the IT investment: Our study emphasizes the need to consider the maturity of the underlying technology and the scope of complementary investments in organizational structures and process in valuing the IT event. These attributes provide guidance regarding the magnitude of information acquisition and learning costs incurred by financial markets in valuing the IT event, and in turn, the efficiency of the market in valuing the IT decision. By using announcement period returns for IT events characterized by high scope, many studies have ignored acquisition and learning costs associated with information on these IT events (*Hypothesis 1*) and assumed the market model as a predictor of returns unconditional on the event (*Hypothesis 2*). Further, IT events are often the outcome of a series of related events, their announcement being one of them. Thus announcement period returns may underestimate the full magnitude of abnormal returns related to the IT event. The above problems are minimized by extending the time horizon for calculation of abnormal returns. Window lengths of three to five years have been shown to reduce the likelihood of confounding events since firms are unlikely to engage in equally economically significant initiatives immediately prior or subsequent to the strategic information event. Hence, the sample size is largely unaffected in these window lengths.

Model of predicted returns: As argued in *Hypothesis 2*, CAPM based measures of risk and return are inappropriate in determining predicted returns unconditional on information events with low maturity and/or high scope. We have demonstrated in the context of outsourcing that incorporating firm specific factors such as experience and prior association and task characteristics such as coordination requirements can help better explain the variance in abnormal returns. Our prescription of including firm and task specific factors in IT value research also relates to sample stratification issues. Studies in finance largely analyze uncategorized samples of events that are assumed to be drawn from a

homogeneous population (Lubatkin and Shrieves 1986). However, emergent research in economics suggests that identifying discrete event characteristics and comparing performance outcomes associated with each characteristic may reveal important patterns in the market's price response. For instance, in our sample of the 100 largest outsourcing initiatives implemented between 1996 and 2005, we find no significant long-term abnormal returns. However, the mean three year buy-and-hold abnormal return for firms engaged in complex outsourcing initiatives governed by variable price contracts and characterized by dynamic process requirements, high coordination costs, lack of prior cooperative association with the provider, and limited experience is -21.2 percent. The equivalent return for relatively simple outsourcing initiatives governed by fixed price contracts is 17.5 percent. Similarly, Gompers et al. (2003) construct a "Governance Index" to proxy for the level of shareholder rights at about 1500 large firms during the 1990s. An investment strategy that bought firms in the lowest decile of the index (strongest rights) and sold firms in the highest decile of the index (weakest rights) earned abnormal returns of 8.5 percent per year during the sample period. These studies demonstrate how theoretical stratification of the sample can reveal important patterns in returns to information events.

A unique strength of the field of IS is its ability to ascribe meaning to performance differences between organizations and the persistence of such differences. Thus, the field is best positioned to identify theoretically distinct groups within a sample of firms experiencing the event to identify what drives price responses to the event. For instance, prior research in strategy suggests that heterogeneity in performance across joint ventures may be explained by various factors - limitations posed by partners' size, age and prior performance, the compatibility between partners, resource complementarity, partners' inability to transfer resources to the venture, or the cumulative experience of the firm in managing similar ventures. The assumption that a sample of joint ventures is drawn from a homogenous population results in the reporting of returns that fail to reflect these regularities in returns to joint venture activity. Thus, moving forward, it is important that research in IS leverage its theoretical knowledge of strategic information events to identify drivers of abnormal returns.

Implications for Practice: Our framework has implications for asset managers who seek investment opportunities based on major IT events while avoiding the pitfalls. Given the lack of information disclosure regarding firm specific competence and risks involved in managing an IT event with low maturity and/or high scope of complementary changes, asset managers must incur the cost of learning about a firm's basic ability to manage or mitigate the risks associated with the IT event and to extract maximum value through effective governance and the inculcation of a culture of business innovation. Traditional asset pricing models have assumed efficiency of capital markets, and largely focused on the management of *beta* or market risk in portfolios. However, our results underscore the inefficiency of markets in pricing certain managerial decisions that reflect intangible information on future cash flows. This, in turn, points to the opportunity in shifting the focus of asset management from beta to the quality of management decisions that impact firms' competitiveness and strategic value.

Our study also suggests that since markets under-react to limited information disclosure, senior IT managers and business executives should carefully weigh the benefits of more detailed disclosure (when the firm is aware of the management challenges as well as its strengths in managing such complexity) against potential opportunity costs in the form of its specific skills and expertise becoming common knowledge to the advantage of its competitors.

	Average revenue (R)	Average market cap. (M)	Announcement period return from ERP (r)	Implied NPV of ERP initiative NPV = M*r	Calculated upfront ERP cost C=.0274*R	5-year cost of maintenance M = .1*C
Ranganathan & Brown (2006)	$8.3B	$8.7B	1.47%	$128M	$227.4M	$91M
Hayes et al. (2001)	$4.8B	$6B	0.19%	$11.4M	$131.5M	$52.5M

Table 1: Returns from ERP investments

Panel A: Long-term BHAR – Full Sample			
	Lowest 30 percent (a)	**Highest 30 percent (b)**	**Difference (a-b)**
UNCERTAINTY	0.34***	-0.56***	0.90***
COORDN	0.39***	-0.51***	0.90***
PRIOR	-0.15***	0.22***	-0.37**
EXP	-0.23***	0.15***	-0.38**
Panel B: Long-term BHAR – Three Year Sample			
UNCERTAINTY	0.30***	-0.69***	0.99***
COORDN	0.33***	-0.65***	0.98***
PRIOR	-0.24***	0.31***	-0.55**
EXP	-0.33***	0.21***	-0.54**

*p<0.10, **p<0.05, ***p<0.01

Table 2: Long-term Buy-And-Hold Abnormal Returns following Outsourcing Implementations

Panel A: Abnormal returns for the event period (-10, 9)		
	Lowest 30 percent	**Highest 30 percent -**
UNCERTAINTY	2.01%	1.55%
COORDN	0.87%	2.98%**
PRIOR	-0.03%	-0.64%
EXP	-0.47%	2.45%
Panel B: Abnormal returns for the event period (-10, 1)		
UNCERTAINTY	0.41%	-0.40%
COORDN	-0.36%	1.84%*
PRIOR	2.01%*	-1.61%*
EXP	2.43%	0.57%

Table 3: Announcement Period Returns following Outsourcing Announcements

	Model I (BHAR)	**Model II (Idiosyncratic Volatility)**
TYPE	-0.001	0.149 (0.114)
UNCERTAINTY	-0.283* (0.141)	0.485*** (0.172)
STRIMP	0.250 (0.315)	0.214 (0.348)
EXP	0.186 (0.131)	-0.243 (0.168)
COORDN	-0.483** (0.230)	-0.107 (0.142)
CONTINUITY	-0.002 (0.101)	-0.153 (0.123)
PRIOR	0.199** (0.095)	-0.077 (0.166)
PRIOR FIN_PERF	-0.091 (0.119)	-0.145 (0.149)
IMR1 – Outsourcing	0.379 (0.248)	-0.512* (0.280)
IMR2 – Contract	-0.285* (0.144)	0.319* (0.178)
Constant	0.099 (0.110)	-0.130 (0.145)
R-square	0.39	0.36

*p<0.10, **p<0.05, ***p<0.01

Table 4: Model of buy-and-hold abnormal returns (BHAR) and Idiosyncratic Risk

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